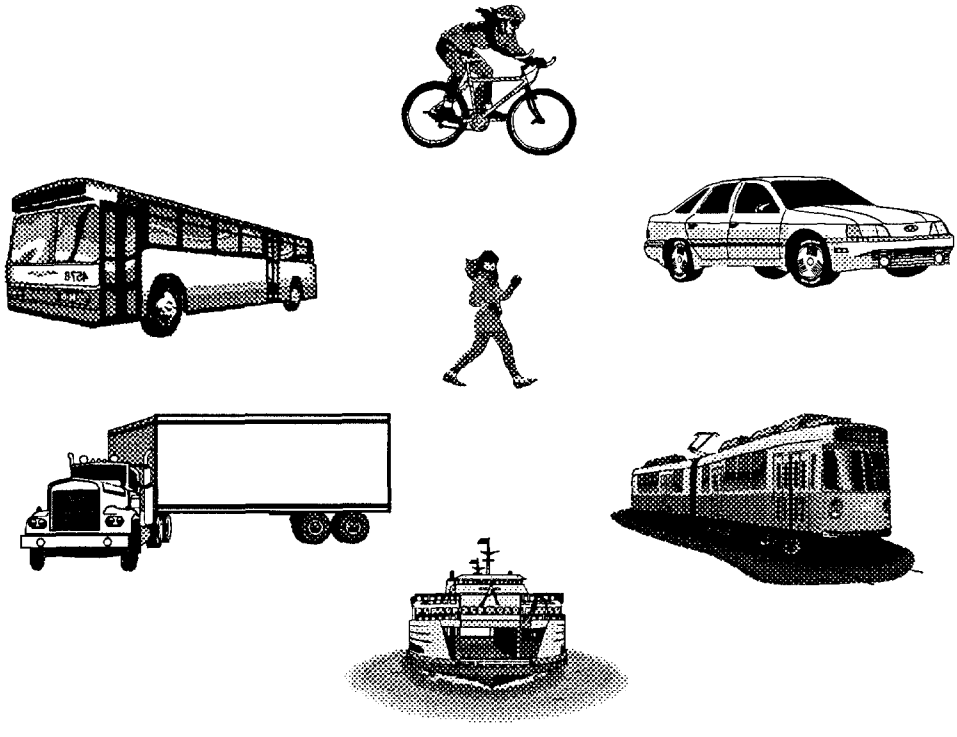
RSPA/VNTSC-SS-TM392-05

REVIEW OF THE TRANSPORTATION PLANNING PROCESS IN THE HOUSTON METROPOLITAN AREA

JULY 1993

prepared for:
U.S. Department of Transportation
Federal Transit Administration
Office of Planning
and
Federal Highway Administration
Office of Environment and Planning



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ACKNOWLEDGMENTS

This report is the fifth in a series produced for the Federal Transit Administration (FTA) and the Federal Highway Administration (FHWA) by the Volpe National Transportation Systems Center (Volpe Center) Research and Special Programs Administration, U.S. Department of Transportation. Contributing Volpe Center staff were William Lyons, Project Manager, and Robert Brodesky (EG&G Dynatrend), Lead Analyst. Other contributors were Patrick DeCorla-Souza of FHWA, and Frederick Salvucci, under contract with the Center for Transportation Studies, Massachusetts Institute of Technology. Overall guidance for the planning review, including production of this report, was provided by the Program Manager, Deborah Burns of the Office of Planning, FTA.

The federal review team, consisting of staff from FTA Headquarters and Region VI; FHWA Headquarters, Region 6, and the Texas Division; and the Volpe Center, participated in the site visit in Houston, and reviewed drafts of this report. Dean Smeins, Chief of the FHWA Planning Operations Branch, provided valuable comments on the report. Staff from the Houston-Galveston Area Council (H-GAC) also reviewed the draft report. The assistance of staff from H-GAC, the Texas Department of Transportation, the Metropolitan Transit Authority of Harris County, the cities of Houston and Galveston, and the Texas Air Control Board during the review is also gratefully acknowledged. Participating state, regional, and local staff are listed in Appendix 1.

Federal Review Team

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SS-49-UM292-5

Table of Contents

Appendices

Glossary of Acronyms

ADA	Americans with Disabilities Act
BPR	Best Peak Hour Capacity Restraint
CIP	Capital Improvement Program
CAAA	Clean Air Act Amendments of 1990
CBD	Central Business District
CMSA	Consolidated Metropolitan Statistical Area
DBE	Disadvantaged Business Enterprise
FAUS	Federal Aid Urban System
FHWA	Federal Highway Administration, US Department of Transportation
FTA	Federal Transit Administration, US Department of Transportation
GIS	Geographical Information Software
HOV	High Occupancy Vehicle
H-GAC	Houston-Galveston Area Council
IDBTF	Interagency Data Base Task Force
ISTEA	Intermodal Surface Transportation Efficiency Act of 1991
IVHS	Intelligent Vehicle-Highway System
MPO	Metropolitan Planning Organization
METRO	Metropolitan Transit Authority of Harris County
NEPA	National Environmental Protection Act
O&M	Operating and Maintenance
PASS	Principal Arterial Street System
RMP	Regional Mobility Plan
SIP	State Implementation Plan
3-C	Continuing, Cooperative, and Comprehensive Planning Process
TAC	Technical Advisory Committee
TACB	Texas Air Quality Control Board
TCM	Transportation Control Measures
TIP	Transportation Improvement Program
TMA	Transportation Management Area
TPC	Transportation Planning Committee
TSM	Transportation Systems Management
TxDOT	Texas Department of Transportation
UPWP	Unified Planning Work Program
US DOT	United States Department of Transportation
US EPA	United States Environmental Protection Agency
UTPP	Urban Transportation Planning Process
UZA	Urbanized Area
VHT	Vehicles Hours Travelled
VMT	Vehicles Miles Travelled
Volpe Center	John A. Volpe National Transportation Systems Center, Research and Special Programs Administration, US Department of Transportation

I. Summary of Findings and Suggestions

This formal, comprehensive review of the planning process in the Houston metropolitan area, conducted by Federal Highway Administration (FHWA) and Federal Transit Administration (FTA) headquarters and regional staff, with input from state, regional and local transportation entities, takes the place of the review of the Houston metropolitan planning organization (MPO) which otherwise would have been conducted by FHWA field and FTA regional staff.

Based on requirements in effect prior to the Intermodal Surface Transportation Efficiency Act (ISTEA), the MPO conducts a competently managed and organized continuing, cooperative, and comprehensive (3-C) planning process, produces adequate planning products, and uses acceptable planning tools. Efforts are being made to implement a multi-modal planning approach, and the transit operator is involved in the process.

The federal review team, however, has made a series of observations and suggestions on each segment of the planning process, highlights of which are listed below. These findings are intended to improve a competent process, and to provide guidance on addressing the ISTEA planning requirements. Sections of the following analysis where each point is discussed in greater detail are noted in parentheses.

The Houston-Galveston Area Council (H-GAC) activities were being carried out in accordance with FHWA and FTA regulations, policies, and procedures prior to ISTEA. In view of the changing requirements and policies of new laws, in particular the Clean Air Act Amendments of 1990 (CAAA) and ISTEA, suggestions have been included to strengthen the process of developing the next long range transportation plan, Transportation Improvement Program (TIP), and State Implementation Plan (SIP). Many of these comments are intended to reinforce changes that have already been initiated by the region to respond to the requirements of the new laws. Even though the comments are specific to Houston, many other large metropolitan areas are currently struggling with many of the same issues.

A. Organization and Management of the Houston Area Planning Process:

1. **All regionally significant planning and management activities, irrespective of funding source, should be included in the Unified Planning Work Program (UPWP) or a supplementary document.** (III.B).

B. Products of the Planning Process:

1. **H-GAC could establish short and long range time frames in its transportation plan** that would reflect the planning of the region's other transportation agencies, particularly, the Texas Department of Transportation (TxDOT) and the Metropolitan Transit Authority of Harris County (METRO) (IV.A).

2. **H-GAC could develop and evaluate alternative scenarios for its transportation plan** that include different combinations of highway and transit improvements, and other strategies that might be necessary to comply with the CAAA and ISTEA (IV.A).

3. **The development of a transit element that provides overall direction while also reflecting the preferred alternative adopted by METRO must be a part of the regional transportation plan update.** Access 2010 does not provide direction on what types and levels of transit services are needed to satisfy forecasted levels of travel demand and to serve different land use patterns (IV.A).

4. **In the future, the MPO should consider the financial impact of each of the options or scenarios included in the transportation plan** before selecting a recommended strategy. The updated plan must include a financial plan that demonstrates that resources necessary to implement it are reasonably available (IV.A).

5. **H-GAC could strengthen the process by which it tracks completion of projects that comprise the TIP** (IV.B).

6. **The TIP could be strengthened by references to the planning that justifies the inclusion of many of the projects by creating explicit links with Access 2010,** and regional objectives. The TIP could also include the priorities and criteria used to develop the document. This would provide a rationale for including projects in the TIP and indicate to the public and advocacy groups the extent to which the process complies with the requirements of the CAAA and ISTEA. Future TIPs must be financially constrained and reflect prioritization of projects as required by ISTEA (IV.B).

C. **The 3-C Transportation Planning Process:**

1. **METRO, TxDOT and H-GAC could develop a formal process to evaluate major transportation investments against planning forecasts** and the goals of the region's long range transportation plan. H-GAC could actively coordinate and encourage efforts of all involved agencies to complete these evaluations of investments (V.A).

2. **The region's transportation planning agencies could use a shared set of population and employment forecasts that are approved by the continuing, cooperative, and comprehensive (3-C) planning process** for all strategic planning, route assessments, and corridor studies. This could improve commitment across agencies to a common vision for regional growth and development (V.C).

3. Even with the Greater Houston Chamber of Commerce and Supergroup's pursuit of regional transportation issues, **the MPO should be the definitive forum for establishing a region-wide transportation vision and for region-wide decision-making on significant transportation projects** (III.A & V.C.).

4. Sub-area and corridor studies have focused on congestion management via transit improvements; however, **future studies should also focus on the impact of a full range of transportation control measures (TCMs) on air quality concerns**, as required by the CAAA (V.C).

5. **The planning for air quality compliance to date has been carried out in a satisfactory manner** (V.D).

6. **When estimating emission impacts for the long-range transportation plan and the TIP for conformity purposes, the analysis must include all significant projects not funded with federal highway and transit funds.** In updating the plan, evaluation of scenarios which test different strategies, such as land use changes and telecommuting or other reductions in home-work trips could be considered. This would provide a comprehensive picture of outcomes achieved by alternative transportation investments and strategies.

7. The scope of the air quality and congestion management activities, from planning to implementation, is extensive; **without a commitment to hiring additional staff, H-GAC could have a difficult time achieving results and meeting mandated deadlines** (V.D).

8. **H-GAC is commended for involving disadvantaged business enterprises in all phases of procurement for professional and support services** (V.E).

D. Tools for Transportation Planning:

1. **H-GAC's travel models could be enhanced to provide the capability to estimate the travel impacts of a wide range of transportation and land use policies**, and to incorporate feedback loops where appropriate (VI.A).

2. **H-GAC could develop land use models capable of forecasting the impacts of transportation on land use** (VI.A).

3. **H-GAC could develop procedures to estimate total costs of transportation alternatives, including private costs, to assist in modal comparisons** (VI.B).

E. Ongoing Transit Planning:

1. **The components of METRO's strategic business plan could be better coordinated by establishing consistent short and long range time frames** for regional growth and development, programming capital improvements and service enhancements, and forecasting revenues and expenditures (VII.A).

2. **From a regional perspective, the connection between METRO's Phase 2 Mobility Plan and the region's long-range transportation plan could be improved.** In the future, competition for flexible ISTEA funds may require that multi-modal transit proposals be presented in terms of contribution to regional transportation objectives (VII.A).

3. **In the update to its strategic business plan, METRO could describe and quantify how projects improve regional air quality, and indicate how air quality objectives influence decision-making** (VII.A).

4. METRO has been examining applications of advanced technology including intelligent vehicle-highway systems and smart buses to mitigate congestion and manage air quality impacts. **METRO is encouraged to move forward with its region-wide advanced technology program**, and to incorporate these components in the planning process (VII.A).

5. **METRO is commended for the impressive range of performance data that it collects and analyzes**, and for its application of data to determine whether or not to maintain a route with low service for "life-line" or social purposes (VII.B).

II. Introduction

A. Background

This report is an evaluation of transportation planning in the Houston metropolitan area, based on an independent review conducted April 27-30, 1992. The report summarizes the results of the review and includes a series of suggestions.

A team of representatives from the FHWA Headquarters, Division and Regional offices; the FTA Headquarters and Regional offices; and the U.S. Department of Transportation's Volpe Center met with representatives of the Houston-Galveston Area Council (H-GAC), which is the metropolitan planning organization (MPO), the Texas Department of Transportation (TxDOT), the Metropolitan Transit Authority of Harris County (METRO), and other agencies to conduct the review.

Prior to the site visit, the team reviewed extensive documentation on the planning process in the area. The site visit consisted of structured meetings with staff from regional, local and state agencies responsible for transportation and air quality planning, and the major public transit provider. Participants in the review are listed in Appendix 1. The agenda for the meetings is presented in Appendix 2. The team also conducted follow-up discussions after the meetings.

Section 23 CFR 450.114 (c) of the revised transportation planning regulations (June 30, 1983) established a self-certification process which requires that the state and the MPO jointly certify that the urban transportation planning process (UTPP) is in conformance with Federal regulations set forth in that section, encompassing transit, highway, and air quality planning. The federal regulations are designed to ensure that urban areas apply a continuing, cooperative, and comprehensive (3-C) transportation planning process to develop plans and programs which address identified transportation needs in the area, and which are consistent with the overall planned development of the urbanized area.

Self-certification is intended to grant responsibility for transportation planning to states and MPOs. Self-certification is also a prerequisite for receiving Federal funds for transportation projects and planning. Certification statements must be provided to FHWA and FTA for review with each new or substantially revised Transportation Improvement Program (TIP).

As stated in the preamble to the FHWA/FTA joint planning regulations, self-certification does not relieve FHWA and FTA of oversight responsibilities and the obligation to review and evaluate the planning process. These responsibilities are discharged through periodic policy and technical committee meeting attendance and review of related program documentation, including the Unified Planning Work Programs (UPWP), technical reports, the TIP, and grant progress reports.

Periodic independent reviews are also appropriate mechanisms for evaluating the planning process. FHWA and FTA are required to judge the credibility of the self-certification designation independently to enable the FTA Regional Administrators/Area Directors and FHWA Division Administrators to make the findings required under the joint planning regulations. This ensures that the planning process is being carried out by the MPO, in cooperation with the state and transit operators, in a fashion consistent with the joint planning regulations.

This formal comprehensive review of the planning process in the Houston urbanized area, conducted by FHWA and FTA Headquarters and Regional staff (Appendix 1), with input from state, regional, and local transportation entities, takes the place of a 1992 review of the Houston MPO which otherwise would have been conducted by FHWA field and FTA regional staff. H-GAC has been found to be in compliance with the regulations in 23 CFR Part 450. In addition, the review team has made a series of suggestions on planning practice, as summarized in section I of this report.

B. Scope of the Planning Review

The purpose of this review is to allow FHWA and FTA to determine how successfully the UTPP addresses regional transportation needs, and whether the planning process meets the requirements of the joint planning regulations. Another purpose of the review is to assess the ability of the existing planning process to address broader responsibilities described under the guidelines implementing the Clean Air Act Amendments of 1990 (CAAA), and the re-authorization of the surface transportation legislation, the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA). ISTEA includes a requirement for Federal certification of the planning process in Transportation Management Areas (TMAs). It is expected that this review will assist the Houston metropolitan area prepare for future formal certification.

The team reviewed support documentation that included the TIP; Access 2010, the region's long range transportation plan; elements of METRO's Strategic Business Plan; the UPWP; and other technical materials related to the UTPP. (Documents are listed in Appendix 3).

The review also focused on the transportation and air quality planning activities of H-GAC, TxDOT, the TACB and METRO.

C. Objectives of the Planning Review

In conducting the planning review, the objectives of FHWA and FTA are to determine if the following situations exist:

- Planning activities of the MPO and H-GAC are conducted in accordance with FHWA and FTA UTPP regulations, policies, and procedures;

- Regional transportation planning is a 3-C process that results in the development and support of transportation improvements for the Houston metropolitan area;

- The transportation planning process involves representation and input on transportation needs from all levels of government, transit operators, the public, and other interest groups;

- The UPWP adequately reflects all aspects of the UTPP and all transportation planning in the area;

- The transportation planning products, including the TIP and regional transportation plan, reflect the identified transportation needs, priorities and funding resources;

- Products of the transportation planning process are multi-modal in perspective, complete, based on current information, and interrelated;

- Requirements and objectives of the CAAA, and Americans With Disabilities Act (ADA) are incorporated into the planning process and supported by transportation development activities.

D. Local Transportation Issues

To understand the regional context in which transportation planning is performed in the Houston metropolitan area, the review team identified the following major transportation issues.

Issue 1: The eight county Houston area is confronting severe levels of congestion. Over the past twenty years, expansion of the highway, local street, and arterial infrastructure has not kept pace with the growth in travel demand. Furthermore, cross-town mobility has been handicapped by the lack of continuity of the local street network resulting from the region's rapid real estate development activities.

Issue 2: According to the region's long range plan, Access 2010, the region's population growth will result in a 45 percent increase in vehicle trips per day and a 78 percent increase in vehicle miles travelled (VMTs). If these forecasts prove accurate, both congestion and air quality problems could worsen under any scenario.

Issue 3: Between 1985 and 2010, Access 2010 also anticipates a 44 percent increase in population and a 45 percent increase in employment. The realism of these forecasts could be questioned. Since the 1970s, Houston has experienced both a boom and a bust economy. Although the region's economy has begun to rebound from the oil bust of the mid-1980s, the recovery has been slow, and it has recently been dampened by the national recession.

Issue 4: The Houston-Galveston eight county area has been designated as a "severe" nonattainment area for ozone under the CAAA. Consequently, H-GAC is required by federal law to incorporate air quality attainment objectives into its metropolitan-wide transportation planning and project evaluation process; adopt quantitative procedures for evaluating air quality impacts; begin to formulate

transportation policy options for region-wide consideration and implementation; and improve air quality results.

Issue 5: Because the area must deal simultaneously with mounting congestion and air quality concerns, the planning process will have to balance potentially conflicting air quality and transportation objectives. For example, CAAA requirements for area-wide reduction in VMTs could conflict with transit financial management objectives and maintaining the region's economic attractiveness. A particular concern is maintaining efficient goods movement throughout the region if strategies limiting vehicular flows are adopted.

Issue 6: Since the ozone problem in Houston is not visible, the public is unaware of the severity of the problem. Public education is critical to generate political support to fund the implementation of effective strategies. In contrast, Los Angeles has visible air pollution, which has stimulated the establishment of institutions, strategies, and revenues for addressing the problem.

Issue 7: The Houston area has developed without zoning, and the region has had no comprehensive land use plan to guide its development. The city of Houston is currently updating its land use inventory and developing land use directions, primarily to preserve the integrity of existing neighborhoods; however, it is anticipated that real estate development, as well as transportation improvements, will continue to be almost exclusively market driven unless the Houston area moves further ahead in land use planning.

Issue 8: In addition to its downtown, the Houston area has a number of major combined use (employment, commercial, retail and residential) activity centers within the Loop (Beltway I-610) and in suburban locations that are experiencing or will experience severe levels of congestion.

Issue 9: Due to a shortfall in the city of Houston's budget and the city's interest in maintaining or improving police and public works services, METRO has recently committed approximately $50 million of its 1992 and 1993 sales tax revenue to support the city's transportation budget. The public mandate intended these funds to pay for transit improvements and transportation mobility projects. Although these revenues will be used by Houston for transportation improvements, the transfer frees the city's budget for other uses, and indirectly subsidizes another important city priority - the improvement of police services.

III. Organization and Management of the Planning Process

A. Metropolitan Planning Organization Designation

H-GAC is a voluntary coalition of governments from the thirteen counties that comprise the Gulf State Planning Region. Policy and management direction for H-GAC is governed by a Board of Directors which includes representatives from the local governments (counties and municipalities) and constitutes the planning region. Membership is not extended to the state or regional agencies, such as TxDOT or METRO, which have actual authority to implement transportation improvements. The organization provides planning and technical support to its members, and acts as a forum for transportation, water quality, housing, aging and regional growth, and development issues.

In April of 1974, the Governor of Texas designated H-GAC as the MPO for an eight county urbanized area which includes Houston, Galveston, Texas City and La Marque. (These counties also constitute the air quality nonattainment area.) H-GAC was redesignated as the MPO for the urbanized area by the Governor in May, 1988. According to the terms of the agreement, H-GAC will continue as the MPO until such time as the Governor should require redesignation.

The MPO is the H-GAC Board; however, the Transportation Planning Committee (TPC) recommends the policy direction and manages the 3-C planning process. H-GAC's documents do not clearly define the official roles of these bodies. They leave the impression that the TPC, rather than the Board, has final authority for the 3-C planning process, and for actions such as self-certification, and final approval and adoption of the regional transportation plan.

The TPC, with the support of H-GAC's technical staff, is expected to carry out the following:

- Guide multi-modal transportation planning conducted by H-GAC, TxDOT, METRO, city and county governments, and other political subdivisions of the State of Texas;

- Provide a public forum for discussion of issues relating to region-wide transportation planning; and

- Advise the H-GAC Board of Directors on transportation programs and issues and recommend the adoption of the UPWP, TIP and the regional transportation plan.

Currently, the majority of the active TPC attendees include city and county engineers and planning staff for the eight county area, and representatives from METRO and TxDOT. H-GAC is interested in modifying the committee's representation to increase local elected official participation and heighten awareness of transportation issues affecting goods movement. The re-constitution of this group would align it with its original purpose. According to H-GAC staff, it would be a forum capable of debating technical as well as political merits of alternative transportation strategies and building consensus regarding the region's vision for future growth

and development. Given the ongoing activities of the Greater Houston Chamber of Commerce's Regional Mobility Committee to create a regional transportation vision and the influence of the Supergroup regarding the region's commitment to significant transportation projects, this move would strengthen the 3-C planning process. In addition, the push for policy review at the TPC level is essential given recent developments brought about by ISTEA and the CAAA. They require the MPO to have a major role in setting the direction and ensuring the implementation of transportation system management (TSM) actions and transportation control measures (TCMs). (Since the review, the MPO has modified the role and responsibility of the TPC and secured greater participation from elected officials. Also, the TPC created a Technical Advisory Committee (TAC) that includes representatives from different transportation agencies, businesses, and environmental groups).

Observations and Suggestions

1. **MPO as regional forum** -- Even with the Greater Houston Chamber of Commerce and Supergroup's pursuit of regional transportation issues, the MPO should be the definitive forum for establishing a region-wide transportation vision and for region-wide decision-making on significant transportation projects. The 3-C planning process should be supported by political and business leaders as the forum for creating the vision for regional mobility, responding to the CAAA and ISTEA, deciding what significant transportation projects to fund, and whether additional funding sources are needed to finance the completion of the long-range plan. While it is reasonable to expect that there will be dialogue outside the formal MPO process, this process, with its requirements for openness and public participation, is the appropriate forum for developing a region-wide vision.

2. **MPO designation** -- H-GAC should modify its descriptions of the organization of the MPO and the 3-C planning process to eliminate any confusion over which body - the Board or the TPC - is the official MPO.

B. Unified Planning Work Program

In accordance with joint FHWA/FTA planning regulations, H-GAC's TPC annually prepares a UPWP. The document describes the multi-modal, federally funded transportation planning activities that are to be conducted for the Gulf Coast State Planning Region's eight urbanized counties. The document is intended to provide other agencies and the public with an overview of the major transportation issues facing the region, and the tasks that will be undertaken to support regional planning.

The UPWP is organized into six work elements which provide for the following:

- administration of the MPO process;
- publication of public relations documents by H-GAC and TxDOT;

- maintenance of region-wide inventories that include demographic, socioeconomic, and transportation system and travel data;

- maintenance and enhancement of the regional plan, including the regional transportation models;

- creation of specific transportation service and facilities plans;

- development of the TIP;

- completion of short-range transit service planning (e.g. elderly and handicapped) and roadway operations studies; and

- completion of studies that are outside of the 3-C planning process.

In its preparation of the UPWP, MPO staff prepares draft planning tasks and solicits task proposals from member governments and agencies for TPC review. A UPWP Task Force is also re-constituted each year to gather input from all implementing agencies in the region. The final selection of the UPWP's work tasks rests with the TPC and is completed in September. METRO's final submissions are not typically received by the September deadline because METRO's Board of Directors does not approve its annual plans and budgets until later in the year. The TPC then amends the UPWP to accommodate any modifications made by METRO's board.

H-GAC has included only federally funded work items in its UPWP. As a result, portions of METRO's general mobility program which are not federally funded are excluded from the UPWP. The joint planning regulations require that all transportation planning activities be included in the UPWP whether or not they are federally funded. This ensures that a mechanism exists for programming scarce resources within a regional planning context.

Limited planning funds and staff shortages have slowed progress in carrying out all of the work items in the UPWP, and have limited related policy analysis. H-GAC recognizes its need to add transportation staff, particularly during the next year, so that it will be able to respond to CAAA and ISTEA requirements. Section 9 funding continues to be used to supplement transit planning conducted by the City of Galveston. No audit problems exist; all funds are expended per annum; and progress reports (including project "closeout" final reports) are in good order and reflect continuous progress in carrying out the work program.

Observation and Suggestions

Several suggestions are listed below on how to improve the UPWP:

1. **Organization** -- The UPWP includes very detailed descriptions of tasks, but several changes could improve its value as a management tool. Future UPWPs could be modified to allow

readers to discern the following:

- how this work program is essential to the metropolitan planning process;
- who are the contributors and the implementing agencies;
- the extent to which the program addresses development of the region's transportation plan and critical transportation issues;
- how the work elements are inter-related and collectively lead to progress in the metropolitan planning process;
- what the relationship of different work elements is to planning activities undertaken in the previous year;
- what the anticipated results or products are of the overall planning effort and individual tasks;
- what the time frame is for completing the work elements, tasks and studies; and
- how it addresses ISTEA planning requirements.

2. **Financial Reporting** -- The funding sources for different work elements and tasks are well documented in the UPWP.

   H-GAC staff indicated a desire to utilize a computerized program for tracking the financial details of the work program. H-GAC is encouraged to move forward with this administrative activity, and incorporate new financial information in the UPWP, including carryovers and shortfalls.

3. **Regionally Significant Activities** -- All regionally significant planning and management activities, irrespective of funding source, should be included in the UPWP or a supplementary document. This will improve the quality of the 3-C planning process by providing a more coordinated and informed mechanism for setting priorities in accordance with regional goals, and programming scarce resources. It will also provide a single comprehensive description of regional transportation planning for public agencies, the private sector, and citizens.

C. Self-Certification

Self-certification of the planning process is done annually in September. The certification must accompany the TIP and be approved by the MPO and TxDOT. The last self-certification by H-GAC was completed in September 1991.

IV. Products of the Process

A. Transportation Plan

The development of a system-wide transportation plan is an important product of a region's coordinated, cooperative, and continuing transportation planning process. ACCESS 2010 is the long-range metropolitan transportation plan for the Gulf Coast State Planning Region. It provides the multi-modal framework for identifying existing and future transportation system deficiencies and needs. The plan is reaffirmed annually by the MPO and then adopted by H-GAC's Board. Every five years, it is updated by H-GAC's transportation staff.

Access 2010 is organized in a logical format. The focus is on identifying existing and future year system deficiencies; the identification and analysis of system options; and the presentation of preferred freeway and thoroughfare, and transit systems. The proposed freeway and thoroughfare system calls for an increase in total freeway lane miles from 433 in 1985 to 1,148 in 2010. The plan also calls for the development of Strategic Major Thoroughfares which would incorporate high geometric design standards. These thoroughfares would offer partial relief from freeway travel demand, and would be used to capture short and medium length trips.

The preferred transit system includes 96 miles of HOV lanes in the study area, and an additional 84 miles of HOV lanes operating outside the METRO service area by 2010. This would constitute a 230 percent increase in HOV lanes over the base year (1985). The strategic transit system also calls for the continued upgrading of local bus service to better serve cross-town trips and the region's transit centers. This would include an increase in buses from 632 in 1985 to 1,243 in 2010. Twenty transit centers strategically located near HOV lanes are also part of the selected alternative.

The plan incorporates population and employment projections developed by H-GAC staff, thus establishing a basis or rationale for identifying future transportation deficiencies and improvements. The plan has only one planning horizon - the year 2010. When considering system options, existing roadway projects (i.e., projects for which funding has been committed and will be implemented by 1995) are included in the analysis.

The plan includes a chapter which identifies categories of regional environmental impacts that need to be considered when implementing Access 2010. These categories include: 1) wildlife and vegetation; 2) geology; 3) water resources; 4) recreation areas and open space; 5) special land uses (e.g., Superfund sites, and active hazardous materials storage or disposal sites); 6) noise; 7) air quality; and 8) visual impacts. Since the plan pre-dates ISTEA, it does not address the fifteen factors discussed in that act. Despite this, it recognizes the importance of improving the pedestrian environment, particularly in newer activity centers. It also recognizes that existing sidewalks are of inadequate size or are non-existent in many parts of Houston. The plan calls for the coordination of walkway development to reduce conflicts between vehicles and pedestrians, to reduce short vehicle trips between nearby buildings, and to increase transit accessibility.

For the purpose of identifying existing system deficiencies, H-GAC compares the 1985 base year roadway network to 1985 counted traffic volumes. From this analysis, H-GAC concludes that almost half of all freeways and one third of all arterials in the region would operate at less than tolerable conditions. Next, five future transportation system options are developed for analysis based on the deficiencies in the current roadway and transit systems. These systems include: 1) the existing system plus the committed freeway/thoroughfare network; 2) existing plus committed transit network; 3) the long-range freeway/thoroughfare network; 4) the long-range transit network; and 5) TSM strategies. These options are evaluated individually, and H-GAC concludes that they did not satisfy anticipated demand.

The update of the plan is scheduled to begin in FY 1993. H-GAC anticipates it will accomplish the following:

- Identify additional TCMs as required by the CAAA or SIP for incorporation into the plan;

- Revise demographic and economic forecasts for 10, 20, and 30 years in the future;

- Reassess the region's transportation programs and needs based on the new demographic and economic forecasts; and

- Provide a financially constrained planning framework. (Access 2010 recommends the completion of an accompanying financial plan).

As part of the reassessment of the region's transportation needs, H-GAC intends to distribute the socio-economic forecasts to sectors, re-estimate travel demand, and then develop a baseline transportation and land use scenario. To ensure compliance with ISTEA, the MPO is considering the development of more than one land use scenario as part of the different transportation options it will be preparing for the transportation plan.

H-GAC recognizes that its plan assessment will be a complex task. Its concern focuses on how to balance the following: 1) local interests supporting extensive roadway improvements; 2) the federal push, stemming from ISTEA, for metropolitan areas to manage and maintain existing highway networks; and 3) the need to meet short and long-term clean air standards by developing politically acceptable strategies.

An effective regional transportation plan must be linked to a vision for growth and development. The Houston region does not appear to have an ongoing commitment to creating and implementing a vision. Without a vision for regional growth and development, the development of a long-term transportation plan by the MPO that focuses on an evaluation of alternatives and environmental impacts will be compromised, particularly when the region should be moving toward meeting air quality standards. This means that the region's transportation planning will be primarily project specific - responding to the travel demands from existing and future development as opposed to providing a guiding hand in the region's development.

Access 2010 includes a financial summary and analysis of the recommended strategy. The plan compares the costs of implementing the different plan elements (between the years 1989 and 2010) with the anticipated revenues from public and private sources. Implementing Access 2010 is estimated to cost $13.5 billion. This cost estimate includes $1.1 billion for a fixed guideway which is no longer under consideration. To finance capital and maintenance through the year 2000 without any new debt financing, Access 2010 indicates that the Greater Houston Chamber of Commerce's Regional Mobility Plan (RMP) estimates a $3.8 billion shortfall.

The plan calls for the development of an accompanying financial plan. It would identify the funding needs and resources by agency, investment priorities, and strategies to secure transportation funding. To accomplish this, the plan calls for more detailed information on the physical condition of the existing transportation infrastructure, and the identification of funding shortfalls by categories of improvements, and new or enhanced revenue sources.

Observations and Suggestions

H-GAC employs a competent approach to develop the region's plan; the following suggestions are offered to strengthen the plan reassessment process that is scheduled to begin during the coming fiscal year:

1. **Time frames** -- H-GAC could establish short and long-range time frames that would reflect the planning of the region's other transportation agencies, particularly, TxDOT and METRO. Currently, TxDOT has a ten year project development plan, and METRO has a strategic business plan with multiple time horizons (e.g., 5, 8 and 18 years into the future).

   No short and long-term time periods (i.e., 5 and 20 years into the future) are explicitly specified in Access 2010. As a result, comparing the regional effects of the different transportation options is difficult. Also, without this comparison, the contrast between the different options and the recommended strategy is not readily apparent.

2. **Alternative scenarios** -- H-GAC could develop and evaluate alternative multi-modal transportation scenarios. Although Access 2010 includes different transportation options, two of the options focus solely on roadway improvements; they exclude any consideration of transit and measures the region might have to consider to comply with the CAAA and ISTEA. An outcome-oriented approach, which compares alternative scenarios for achieving CAAA requirements and economic goals, would inform the political decision-making process on the range of choices or solutions to comply with the law. This approach would also begin to address the fifteen factors discussed in ISTEA.

   Alternative scenarios could consider the following:

   a. **Optimistic and pessimistic population and economic forecasts** -- This key step will stimulate discussion among political and civic leaders, as well as the public, regarding the direction of the region's growth and development. Consideration

of alternative population and socioeconomic forecasts is desirable given Houston's recent economic history, and its continuing struggle to diversify its economic/employment base. Since the 1970s, Houston has experienced both a boom and a bust economy. Although the region's economy has begun to rebound from the oil bust of the mid-1980s, the recovery has been slow, and it has recently been dampened by the national recession.

b. **Alternative land use and development patterns** -- Scenario development presents an opportunity to consider the role of transportation in shaping the region's future land use and development patterns. One possibility is to evaluate how to respond to a largely market-driven environment (i.e., the status quo); the other option is to evaluate a coordinated transportation and land use policy that could be used to enhance existing activity centers.

c. **Multi-modal transportation demands/needs and TCM strategies** -- For Houston, this would require consideration and measurement of different levels or mixes of roadway improvements, by class, that are needed to serve future automobile usage and further enhance transit and multi-occupancy vehicle usage. Similarly, as part of this effort, a range of TCMs could be identified (e.g, home-job balance actions; telecommuting), and their anticipated effects measured in terms of travel or environmental demands.

3. **Inclusion of METRO's preferred alternative** -- The development of a transit element that provides overall direction while also reconciling the preferred alternative adopted by METRO must be part of the reassessment. Access 2010 does not provide direction on what types and level of transit services are needed to satisfy forecasted levels of travel demand and to serve different land use patterns. The transportation options and the recommended strategy essentially incorporate METRO's planned capital improvements for different time periods.

4. **Financial impact** -- In the future, the MPO should consider the financial impact of each of its options or scenarios before selecting a recommended strategy. The transportation plan it adopts must be financially constrained and include a plan that demonstrates that resources needed to implement it will be reasonably available, as required by ISTEA.

B. Transportation Improvement Program (TIP)

H-GAC, as the MPO, takes the lead in the annual preparation and approval of the TIP. The preparation of the document is guided by the TPC. Six months prior to the scheduled adoption of the TIP, H-GAC requests all implementing agencies to identify projects for inclusion in the TIP and then establishes a TIP Task Force. The Task Force determines the region's transportation priorities, and applies evaluation criteria for deciding which projects will be included in the TIP. Once the final TIP has been adopted by the H-GAC Board, it is then submitted to the Governor who submits it on behalf of the state to the FTA and FHWA.

The documentation included in the TIP should indicate how the priorities used for including projects fit within the regional context established by the regional transportation plan, and the requirements established by ISTEA. In this way, the TIP becomes a strategic document for implementing the plan. Also, this linkage to the plan should be explicit and transparent so that the public understands how it can participate in the strategic planning process and influence the TIP project selection process.

H-GAC's process also requires that the planning documents of the implementing agencies (TxDOT, METRO, Houston and Galveston) provide the rationale or justification for projects submitted for inclusion in the TIP. In this way, local plans mirror the regional transportation plan. Each year both METRO and the City of Galveston obtain private sector comments when developing annual updates to their five year service plans. For METRO, private sector involvement in planning and operating projects is accomplished through public hearings.

The 1992 TIP included an annual element of projects as well as a five year listing. In response to ISTEA requirements, H-GAC's 1993 TIP covers a three year period from 1993 to 1995. Capital projects funded by FTA and FHWA are required to be listed in the TIP. State and local projects that do not receive federal funds are also included in the TIP to make the document more comprehensive and useful.

H-GAC does not monitor the expenditure of the funds. At the time of the review, H-GAC's staff believed that the 1992 TIP (particularly the TxDOT element) was approximately 50 percent over-programmed. In the fiscal year ending August 1992, 75 out of 225 programmed projects were implemented. Under ISTEA, TIPs for fiscal years beginning on or after July 1, 1992 must be financially constrained. That is, no over-programming will be allowed. In addition, the adoption of a planning process that focuses on specific outcomes (for example, VMT reductions) and includes alternative scenarios for achieving those outcomes could highlight the financial choices and result in a financially constrained plan.

Similarly, the MPO staff does not track local projects that use Federal-Aid Urban System (FAUS) funding. TxDOT implements FAUS projects through its Principal Arterial Street System (PASS). These urban arterial corridors are approved by the participating cities, the MPO Policy Committee, and the transit authority. Cities which are implementing FAUS projects on the PASS system are allocated matching funds from state revenue.

A major focus of the 1992 TIP was air quality conformity analysis. The EPA's interim guidance was employed by H-GAC to evaluate the conformity of TIP projects. H-GAC's documentation indicates that the conformity analysis was conducted for all projects in the TIP for which construction funds have been earmarked; however, conformity analysis must include all projects in the TIP as well as significant projects funded with non-federal funds. Furthermore, the documentation does not include a discussion of the modeling procedure that was used to estimate 1996 and year 2007 mobile source emissions for build and no-build scenarios. From this analysis, H-GAC concluded that implementation of the 1992 TIP (the build scenario) would contribute to continued reductions in the number and severity of ozone exceedances and adhere

to ambient air quality standards for carbon monoxide, as required by the CAAA.

The 1982 SIP identified the following TCMs for the Houston metro area: 1) vanpooling; 2) park and ride lots with express bus service; 3) additional peak hour buses; 4) transit maintenance facilities; and 5) transitways. Each of these measures was fully implemented by 1987. Even though the SIP has not been revised since 1982 to include any new control measures, the Houston region has identified and implemented TSM projects designed to further reduce mobile source emissions through better management of traffic congestion and travel demand. To accomplish this, TSM projects totaling more than $56 million have been included in the 1992 TIP. The measures include: 1) transit and paratransit services; 2) traffic signal coordination, timing, and ramp metering; 3) channelization; and 4) intersection improvements.

Since April, 1992, when the on-site review was conducted, the MPO decided to move forward with ISTEA "revisions" to its TIP. The MPO has developed criteria (based on the TxDOT project selection criteria) for its TIP Task Force to use when evaluating candidate projects; it is planning on including far fewer construction projects and is developing a financially realistic document.

Observations and Suggestions

1. **Project tracking** -- H-GAC could strengthen the process by which it tracks completion of projects. Technical and financial milestones prior to construction should be monitored and reported on a regular basis and from one TIP to the next. This tracking is particularly important for certain funding sources, such as FAUS funds, which are earmarked for the Houston region. We recognize that TxDOT currently administers these funds and tracks their use. However, this does not allow for a regional assessment regarding the efficiency of expenditures for the full range of projects in the metropolitan area.

2. **Stronger links to the plan** -- The TIP could be strengthened by referencing the planning that justifies inclusion of the projects (including TCMs and TSMs) by creating explicit links to Access 2010 and objectives.

3. **Project selection criteria** -- The TIP could include the basis and criteria used to select projects. This would provide a rationale for project selection and indicate to the public and advocacy groups the extent to which the process complies with the requirements of the CAAA and ISTEA.

4. **Significant local projects** -- H-GAC is encouraged to continue incorporating all significant local projects in the FY 1993 TIP or a supplemental document. The intent is to improve regional coordination of transportation projects and create opportunities for assessing the benefits from all programmed traffic and transit improvements.

5. **Responding to ISTEA** -- In its revision to the 1993 TIP, the region is commended for responding to ISTEA. H-GAC and TxDOT have begun to shift the emphasis of the TIP

from new construction to improving the efficiency of the existing transportation system. The region is encouraged to continue moving in this direction so that these changes are coordinated with the reassessment of the transportation plan and the revised SIP.

V. Elements of the 3-C Transportation Planning Process and Related Activities

A. Evaluation of the Impact of Recent Major Transportation Investments

The Houston region does not have formal guidelines directing when to evaluate major highway and transit investments, and the methodologies to be applied. Evaluations are not formally recognized as the responsibility of specific unified working groups. These evaluations should be elements of a sound 3-C planning process, contrasting actual to forecasted impacts on cost, ridership (in the case of transit), automobile usage (vehicle miles travelled), and other relevant factors, including land use and air quality. These analyses would allow testing of assumptions made at project approval related to land use, demographics, and pricing policies, and would allow a critical assessment of the validity of these analytical methodologies.

Despite this, independent assessments or project evaluations are being conducted by implementing agencies. For example, the Harris County Toll Road Authority has conducted cost effectiveness studies of the Hardy and Sam Houston tollroads. These studies were initiated because toll revenues were less than what was projected during the planning stages for each of these roads.

In addition to this, METRO, with the assistance of the Texas Transportation Institute, monitors usage of I-10 and I-45 HOV lanes. This surveillance indicated that the HOV lane on the Katy Freeway (I-10) had become more popular, and that it was timely to increase the restrictions on vehicle occupancy from two to three during the morning peak hours. This shift essentially justifies continued financial investment in HOV lanes. For the purpose of distributing sales tax revenue to local jurisdictions for general mobility projects (e.g., roadway grade separation, railroad grade separation, roadway widening/improvement, roadway extension, intersection improvements and overlays), METRO has developed a benefit-cost methodology which it uses annually to determine which of the locally sponsored projects it will fund.

For the most part, the MPO is not involved with monitoring roadway conditions or assessing region-wide transit. TxDOT inventories the roadway network down to the arterial level every three years; and METRO conducts biannual fixed asset and service delivery reviews.

TxDOT has recently adopted a project selection process to reflect the intent of ISTEA and the CAAA. The process has the following goals: 1) preserve the existing infrastructure; 2) ensure safety; 3) provide congestion relief; 4) ensure environmental protection and enhancement; 5) enhance economic development; and 6) enhance aesthetics. The process recognizes the necessary involvement of MPOs in project selection and programming, and ISTEA's flexible funding provision. For each goal and project category, TxDOT has identified criteria for evaluation. The MPO has adopted these project selection criteria with some modification for evaluating candidate projects for inclusion in the TIP.

Observations and Suggestions

1. **Evaluation of major transportation investments** -- METRO, TxDOT and H-GAC could develop a formal process to evaluate major transportation investments against planning forecasts as well as the goals and objectives of the region's transportation plan. Although major highway and transit investments occur regularly throughout the Houston area, no formal guidelines exist on how or when to evaluate the projects once they have been completed. Also, no guidance exists on which agency should take the lead for conducting these types of studies.

   The evaluations conducted by the Harris County Toll Road Authority could be a part of a coordinated regional planning effort to assess facility investments. In addition, agency staff anticipate that sizeable investments will continue in transit centers and transitways given the thrust of ISTEA and the CAAA. These investments could be routinely evaluated from a region-wide perspective.

2. **MPO coordination of investment evaluations** -- As the MPO, with responsibilities for assuring the credibility of the 3-C planning process, H-GAC could actively coordinate and encourage efforts of all involved agencies to complete these evaluation of major investments. H-GAC need not be directly responsible for undertaking all analyses.

B. Monitoring, Surveillance and Reporting

The region has numerous data collection and preparation activities underway by various agencies to reappraise the transportation plan, complete corridor studies, assess transit services, and complete air quality analyses. During FY 1991, a draft monitoring and surveillance plan, known as the Operations Plan, was completed. The plan covers the type and frequency of data collected; who collects, stores and maintains the data; and what documents result. Due to concerns expressed by local jurisdictions about potential infringement on their authority, the MPO has not adopted the Operations Plan.

H-GAC's Transportation Department has been updating demographic and employment forecasts almost annually. In the near future, H-GAC's Data Services Department will begin updating the population and employment forecasts every two years. To enhance its population and employment forecasting capabilities and improve its forecasts' credibility, H-GAC has decided to purchase the Integrated Transportation and Land Use Package developed by Steven Putnam at the University of Pennsylvania.

H-GAC has utilized a bottom-up approach that uses land use counts and utility permit information along with census tract data to develop a set of demographic projections for the urbanized area. For small areas, forecasts were made in January 1989; regional control totals and the 1996 forecasts were made in 1991. The 2010 forecasts, which pre-date the 1990 census, are currently being revised.

For transportation planning, H-GAC is interested in having TxDOT and METRO use its demographic and employment forecasts. No formal inter-agency agreement exists which requires these agencies to commit to these numbers. METRO has begun to use H-GAC's forecasts; however, it has had a contract with the University of Houston for the development of population data and growth factors. TxDOT is required by the state to use the forecasts developed by the Texas Water Development Board. H-GAC has recently been allowed to review the forecasts for the Houston metro area to achieve greater consistency. The Texas Water Development Board has prepared low and high forecasts; H-GAC's forecasts are essentially mid-way between these two.

H-GAC has also begun to offer a geographical information software (GIS) program that utilizes a range of data: population and employment estimates along with land use, water and sewer, and transportation information. By developing this service, H-GAC offers a comprehensive data base which ensures that all the different planning groups concerned with transportation, land use and development patterns are using consistent information. For example, this will enable H-GAC, TxDOT, and METRO to use one transportation network for planning and analysis purposes to consider the impact of different strategies. The coordination of the GIS program by the different agencies is currently being negotiated.

TxDOT has several traffic count programs which include monitoring major segments of key highways. H-GAC independently conducts CBD cordon counts on a three to five year cycle. In the mid-1980s, there was interest in having the region's cities participate in a regional counting program. Since no funding was available, the program never came into existence; local jurisdictions, however, do provide H-GAC with whatever counts they perform.

TxDOT and H-GAC recently completed a special survey of workers within the eight county metro area to determine the average vehicle occupancy to work. These data will establish target auto vehicle occupancies for both the region and major employment zones. As part of this effort, TxDOT has conducted traffic counts on minor arterials and some collectors. Additional traffic counts at the local road level will be needed to improve the estimation of inter-zonal VMTs and the air quality analyses that are planned. Similarly, H-GAC has prepared a vehicle classification data base which will be used to support the development of the 1990 baseline emissions inventory.

Starting during the last quarter of 1993, H-GAC will begin to revise its 10 year old regional travel survey. The survey is intended to provide a comprehensive picture of travel behavior in the metro area, and a discrete level of detail for re-estimating the regional transportation model. H-GAC is currently considering surveying 5 percent of the region's houscholds. As part of this effort, H-GAC also plans to conduct surveys that will focus on external trip generation, goods movement, and commuter/work place trips. This work will follow the update of the regional transportation plan which is scheduled for completion by September 1993. The timing is unfortunate since discrete household travel behavior should influence the travel demand, air quality, and scenario development portions of the plan. Without a major increase in its transportation staff, H-GAC may not be able to improve coordination of these efforts in time to

have an updated plan by October 1993, the target date in the joint FHWA/FTA interim guidance for updating transportation plans in non-attainment areas.

Observations and Suggestions

1. **Coordination of data collection** -- The region could improve the coordination of data collection and monitoring efforts that are currently being performed by H-GAC, TxDOT, and METRO. Given the large number of ongoing data collection activities and the demands for additional research to meet ISTEA and the CAAA requirements, the region could consider different ways to achieve greater efficiencies. TxDOT and METRO are moving closer to using the population and employment forecasts, and the GIS transportation network developed by H-GAC. Further movement toward meeting this objective could be achieved by finalizing an inter-agency agreement outlining roles and responsibilities for different data collection activities and the Operations Plan which was prepared in FY 1991 as a blueprint for data surveillance.

2. **Staffing and completion of planning tasks** -- H-GAC contends it needs more staff to undertake the research and development of programs within the time frames mandated by federal legislation. The review team suggests that H-GAC employ other public agencies or outside consultants to resolve timing problems or undertake key planning tasks. This approach could have been used to complete the 10 year regional travel survey prior to the update of the transportation plan by October, 1993. Furthermore, the timeliness of the completion of the regional travel survey is important since the data are needed to recalibrate or validate the regional travel demand model and produce an updated plan.

3. **GIS technology** -- H-GAC is encouraged to move forward with the GIS technology to accomplish the following: achieve coordination and cooperation with METRO and TxDOT; update the long range transportation plan; undertake scenario analyses; conduct corridor and special transportation studies; and serve local jurisdictions and the private sector. The GIS technology will prove to be a powerful tool for analysis and testing transportation scenarios.

C. Ongoing and Corridor Multi-Modal Planning Approach

H-GAC and other agencies are performing limited economic and demographic planning at the regional level. H-GAC's Transportation Department has been producing population and employment forecasts. With the formation of H-GAC's new Data Services Department, H-GAC anticipates that its forecasting capabilities will improve and gain greater credibility. Eventually, H-GAC would like its regional forecasts to be used by METRO for strategic planning and route assessments.

As discussed above, the region lacks formal urban development goals and land use plans. In the absence of formal direction in these areas, local policy has been to ensure that land development is compatible with ordinances regarding public safety. The city of Houston is

developing a land use inventory which will be tied to its permit and tax assessing process via GIS software. This computerized system will be able to produce updated land use maps automatically.

Typically, the corridor and multi-modal transportation planning in the region is conducted in a coordinated fashion by H-GAC, TxDOT and METRO. The partnership is most evident in the planning and the construction of the region's transitways by METRO and TxDOT. Currently, in the North Houston area, METRO and TxDOT are widening freeways and constructing busways which will facilitate travel to downtown. These activities reflect innovative approaches by different implementing agencies to improving the region's general mobility and to multi-modal planning (i.e., the transit agency is financing the construction of busways along with transit centers on or near area freeways to promote multi-occupancy vehicle commuting).

Impetus for the region's ongoing planning and special transportation studies is provided by air quality and congestion management concerns. For example, H-GAC completed a system level air quality conformity analysis of Access 2010 and the TIP. It is currently preparing a Congestion Management Plan which will provide the basis for the Houston area's TCM element of the SIP.

For the purpose of implementing transportation projects, METRO and TxDOT have developed a close working relationship. Currently, the regions' agencies, including H-GAC and the TACB, are attempting to solidify the institutional structure to effectively implement TCMs (for example, inspection and maintenance, and employer-based VMT reduction plans) to meet the schedule set by the CAAA. This includes dedicating a sufficient number of staff to implement the air quality mandates.

H-GAC, along with other agencies and neighborhood organizations, has completed small area and corridor studies that focus on congestion management concerns. These studies include the following:

- A transit feasibility study of the North Channel area for which residential and employee travel surveys were conducted;

- A suburban mobility study on how to improve inter-area transit services in North and West Houston. This was undertaken by H-GAC and the North and West Houston associations with guidance from METRO and TxDOT. It specifically focused on: 1) transit service to and from Park and Ride lots; 2) local feeder transit service between local origins and destinations; 3) expansion of vanshare services to low-density employment centers; and 4) additional transit centers to facilitate transfers at non-downtown activity centers.

- A comprehensive transportation strategy for making arterial, freeway, transit, and pedestrian improvements for the Post Oak - Galleria area, which is five miles west of downtown and the size of Denver's CBD. The study was spearheaded by the area's

special improvement district, which has been given broad powers by the state legislature to acquire rights-of-way and make transportation improvements. The study was completed with the assistance of H-GAC, METRO, the City of Houston and TxDOT.

- An advanced technology/IVHS program for traffic control and surveillance on the region's highway network. This is an ongoing project that is being conducted by METRO staff.

In addition to the MPO planning process, the Greater Houston Chamber of Commerce has spearheaded the development of Houston's Regional Mobility Plan (RMP). The Chamber issued the first RMP in 1982, and then a second one in 1989. It is intended to be an important catalyst for improving mobility and maintaining the region's economic vitality.

An assessment of the region's process for balancing the cost of its approved plans with its financial capacity was completed in August 1989 in the RMP and in November 1989 in Access 2010. The MPO's current work program includes an assessment of the status of proposed projects within Access 2010, the purpose of which is to estimate the cost of completing Access 2010. As previously stated, Access 2010 suggested that the proposed plan elements were probably within the financial capacity of the implementing agencies; however, the RMP estimated a $3.8 billion shortfall through the year 2000.

Observations and Suggestions

1. **Population and employment forecasts** -- The region's transportation planning agencies could use a common set of population and employment forecasts approved by the 3-C planning process for all strategic planning, route assessments, and corridor studies. This could improve commitment across agencies to a vision for regional growth and development and the MPO's long-range plan.

2. **Sub-area and corridor studies** -- Sub-area and corridor studies have focused on congestion management via transit improvements; however, future studies must start to focus on the impact of a full range of TCMs on air quality concerns, as required by the CAAA. The Congestion Management Plan, currently being prepared by H-GAC, will provide a basis for evaluating the impact of TCMs at the sub-area and corridor level.

3. **Joint studies** -- The region's transportation planners, and business and neighborhood associations, are commended for joining forces to study sub-area transportation issues and to develop congestion management strategies that are in the spirit of ISTEA.

D. Consideration of Air Quality

The Houston area's air quality planning is at a critical stage. The TACB recognizes that the metropolitan area must strive to meet the deadlines for mobile source emissions reduction that

have been set by the CAAA. At the same time, the Houston region is rethinking its planning process and developing congestion management strategies in light of the mandates of the CAAA and ISTEA.

Since the metropolitan area has been designated as a severe non-attainment area for ozone, the SIP must be revised by November, 1993, to include TCMs which will effectively achieve major reductions in mobile source emissions. As one of these measures, the CAAA mandates the inclusion of plans for large employers to institute trip reduction programs and VMT reduction strategies. The intent is to increase the average passengers per vehicle work trip by not less than 25 percent above the current average for all area work trips.

This is understood to be a massive undertaking requiring extensive public education and outreach to assist employers with their plans. The TACB is considering designating H-GAC as the lead agency for implementing the program in the Houston area. The two agencies currently estimate that effective implementation would require training a transportation coordinator and hiring approximately eight more people.

The success of the employer trip reduction program will depend to a great extent on METRO's transit infrastructure and its services. The METRO service area, however, does not coincide with the designated non-attainment area. Approximately forty percent of the region's employers, including many of the large petro-chemical plants, are located outside of the service area. METRO will need to assess the benefits and costs of serving outlying areas and population centers in light of the region's air quality goals for reducing VMTs.

This requirement for large employers to institute trip reductions is evidence of the shift in the CAAA from "process" to "outcomes." The Houston MPO recognizes this shift and is attempting to organize a lean but effective program to meet the challenge. Nevertheless, the planning activities and implementation measures that the region is pursuing might not be sufficient to reduce emissions to the extent required by the CAAA. Local regulations affecting parking, land use, and land development policy might be necessary to bolster these actions and bring about further modification in individuals' travel behavior. The challenge to the planning process is to accomplish the mandated results in an area without a history of strong local intervention and without damaging its economic attractiveness.

The TACB and the Houston region are considering additional measures which include the following: 1) the initiation of a vehicle inspection and maintenance program; 2) the sale of reformulated gasoline which would have a lower content of organic and other toxic compounds; 3) the use of compressed natural gas or other fuel alternatives by transit organizations, private fleet operators, and public schools; and 4) legislation which would toughen the vehicle emission standards for automobiles.

H-GAC is currently preparing the Congestion Management Plan as required by ISTEA, which is intended to be the basis for the TCM portion of the SIP's air quality implementation program for the metropolitan area. The plan will be ready for public review by January, 1993. The

following are the objectives of the Congestion Management Plan: 1) the identification of short and long-range TCMs to improve traffic flow and congestion; 2) the evaluation of the emission reductions stemming from different TCMs; 3) the estimation of VMT reductions resulting from TCM applications; 4) the calculation of the cost-effectiveness of potential TCMs; and 5) the identification of initiatives.

The Houston region recognizes that it must develop effective means of both complying with the CAAA and maintaining the region's economic vitality and attractiveness. H-GAC is concerned that goods movement could be subjected to TCMs that restrict truck usage at peak periods in different portions of the urbanized area. H-GAC is considering initiating a study that will address the concern and develop alternative strategies, such as the use of rail rights-of-way, to enhance goods movement.

As part of the 1982 SIP, the following control measures were identified to achieve reductions in mobile source emissions: 1) construction of transitways; 2) transit maintenance facilities and park and ride lots; and 3) the expansion of express bus and vanpooling services. These TCMs played a large role in the development of the regional transportation plan. Because these measures were fully implemented by 1987, the current planning, i. e., the development of the Congestion Management Plan and the reassessment of the regional transportation plan, is timely.

As required by the CAAA, a conformity analysis of ACCESS 2010, the transportation plan, and the 1992 TIP was performed by H-GAC. It was done in accordance with the Interim Conformity Guidance (June 7, 1991) issued by the US EPA and DOT. The analysis was based on a Build versus No Build scenario for current and future projects (in the TIP and the plan). The analysis included only projects eligible for federal highway and transit funding; however, federal regulations require that all projects, whether or not they are eligible for federal funds, should be included in the conformity analysis.

The Highway Pollutant Emissions Model (IMPACT) along with EPA's emission factor model, MOBILE 4, was used to derive emission estimates. The estimates were based on travel and congestion data developed by H-GAC as well as its most recent 1996 population and employment forecasts. Based on this analysis, the TPC found ACCESS 2010 and the TIP to be in conformance with the SIP.

Observations and Suggestions

1. **Air quality compliance** -- The planning for air quality compliance to date has been carried out in a satisfactory manner.

2. **Inclusion of significant projects** -- When estimating emission impacts for the regional transportation plan and the TIP for conformity purposes, the analysis must include all significant projects not funded with federal highway and transit funds. In updating the plan, evaluation of scenarios which test different strategies, such as land use changes and telecommuting or other reductions in home-work trips, could be considered. This would

provide a more comprehensive picture of outcomes achieved by alternative transportation investments and strategies.

3. **Economic attractiveness** -- The process for revising the Houston element of the SIP is developing, and it will include an evaluation of the effectiveness of different control measures. As part of this evaluation, a priority should be the maintenance of the economic attractiveness of the Houston area. This could require changes in goods movement and METRO's service area, and an examination of alternative ways transit services could be sold to employers and employees outside of the service area.

4. **Staffing** -- The scope of the air quality and congestion management activities, from planning to implementation, is extensive. Without a commitment to hiring additional staff, H-GAC could have a difficult time achieving results and meeting mandated deadlines.

E. Outreach Efforts

H-GAC, METRO, and TxDOT conduct outreach efforts independently of one another. Each organization relies on citizen input at public meetings and hearings. As part of the review process for its revised bus plan, METRO conducted 22 public meetings. It also conducts public meetings on proposed changes in transit service. For the purpose of directing transportation policy, public referendums have been held on issues such as transit and toll roads.

Citizen Participation

H-GAC makes an effort to involve citizens from the 13-county service area and representatives of environmental action groups whenever possible. Its strategy includes publication of an annual report on the status of transportation planning, press conferences and press releases, and the inclusion of citizens on its transportation and air quality sub-committees. Several H-GAC committees hold periodic evening meetings to facilitate citizen attendance. In addition, at the start of TPC meetings, citizens may indicate their desire to make comments.

Public meetings are held prior to adoption of the regional transportation plan, the regional aviation plan, and the reliever airport plan. H-GAC also held public meetings on the 1992 TIP prior to its adoption. All meetings are publicized through public notices in local newspapers two weeks in advance of meeting dates.

Minority Participation

Currently, minority representation on H-GAC's boards, advisory councils and committees is not representative of the minority population residing in the metropolitan area.

H-GAC's policy is to involve disadvantaged business enterprises (DBEs) to the maximum extent in all phases of its procurement practices. H-GAC insures that all its contractors provide equal employment opportunities to socially and economically disadvantaged individuals. Upon request,

H-GAC provides DBEs with information on the preparation of proposals, job performance requirements, and procurement opportunities. H-GAC encourages joint ventures between DBEs and between majority and minority firms. It also uses minority and female focused newspapers, local minority chambers of commerce, and other relevant organizations to inform DBEs about procurement processes. Each H-GAC department has a DBE coordinator who is charged with promoting minority business enterprises within his/her department.

Private Sector

H-GAC has established a Public-Private Sector Privatization Committee consisting of public and private sector transportation operators, private consultants, and representatives from TxDOT, FTA, H-GAC transportation staff, and the H-GAC's TPC. The committee explores how public and private transportation operators can cooperatively plan and deliver transit programs and services. It also acts as a conduit for private transportation operators and possible new business entrants to participate in the region's planning process.

H-GAC works to assure that the Committee members' views and proposals are seriously considered by the region's transit authorities during the preparation of the TIP. In addition, METRO and the City of Galveston notify and involve the private sector in developing the annual updates for their Five Year Service Plans which form the basis for TIP submittals. H-GAC invites private transportation providers to participate in its annual planning process for the UPWP and the regional transportation plan.

Observations and Suggestions

1. **Public outreach** -- H-GAC is commended for its efforts to provide an effective means for citizens, representatives of environmental action groups, and private transit operators to participate in the planning process, through membership on sub-committees. H-GAC could consider expanding outreach efforts to include private groups such as large employers; employer associations; labor organizations; financial, real estate, and development associations; and environmental organizations.

   Development of a consensus among competing groups on regional strategies early in the planning process may be particularly useful in preparing to deal with the CAAA and its compliance requirements. This consensus building would be particularly helpful for implementing TCMs, such as employer-based trip reduction plans, and avoiding CAAA based litigation that is occurring in other areas.

2. **Minority participation** -- Outreach and consensus could be improved if the make-up of the membership of H-GAC's Board and committees more closely reflected the UZA's minority population.

3. **DBE involvement** -- H-GAC is commended for involving DBEs in all phases of its procurement for professional and support services.

4. **Opportunities for review and comment** -- H-GAC will need to continue to provide opportunities for early review and comment on its transportation plans and TIPs prior to approval.

VI. Tools, Skills and Data Base for Transportation Planning

A. Travel Demand Forecasting

The application of the currently used travel models is a cooperative effort undertaken jointly by H-GAC, METRO, TxDOT, and the City of Houston.

TxDOT and H-GAC work together to develop roadway networks with review by METRO and the municipalities. TxDOT and the City of Houston develop and maintain land use data. These data, along with input from the municipalities, are used by H-GAC staff to develop the various socioeconomic variable inputs to the models. An Interagency Data Base Task Force (IDBTF) approves the data.

Trip generation (with the exception of external trips) and distribution is then performed by H-GAC. TxDOT generates external-internal and through trips. Trip tables from distribution are sent over to METRO, along with peak speeds estimated by H-GAC. METRO develops and maintains the transit networks and applies a mode choice model. Auto person trip tables output from the mode choice model are then sent by METRO back to H-GAC. Auto-occupancy estimates from the mode choice model are ignored, and H-GAC applies its own auto-occupancy estimation procedures and HOV carpool estimation procedures. H-GAC then performs a highway traffic assignment.

The mainframe modeling package used for trip distribution, HOV carpool estimation, and traffic assignment is maintained by TxDOT. METRO uses the UTPS package developed by FTA/FHWA. H-GAC has purchased the EMME-2 microcomputer package, but does not have the capability to run all of the travel models using it. Currently, H-GAC is entirely dependent on METRO for mode choice model runs, and suggests that the complexity of the mode choice model justifies their decision not to develop this capability.

A Travel Forecasting Technical Committee provides coordination and review of the results to check reasonableness. The Technical Committee is comprised of representatives from H-GAC, TxDOT, METRO, the City of Houston and the Texas Transportation Institute.

The forecasting procedures reflect the current state-of-the-practice, with some variations from general practice which are noted below:

- For trip distribution, a variation of the gravity model called the "atomistic" model is used. This model appears to be superior to the traditional gravity model since it considers travel opportunities within a zone to be spatially distributed rather than concentrated at a single theoretical point (i.e. the zone's centroid). Thus, trips between two zones are not assumed to occur at a single travel time, but over a range of travel times, and trips are distributed in a disaggregate manner.

- A peak period (AM) assignment is done, but only for the purpose of getting congested speeds for use in mode choice. An AM peak network is coded, and daily trip tables from trip distribution are factored to get AM peak trips. Assigned directional volumes are then compared with capacities to estimate peak speeds for use in the mode choice model. A modified application of the Best Peak Hour Capacity Restraint (BPR) function was found to provide travel time estimates which compared favorably with observed travel times obtained from an extensive travel time speed survey performed in 1985 by TxDOT.

While the above procedures demonstrate advancements beyond the current state-of-the-practice, H-GAC will need to make other advances in its modeling practice to address the requirements of the CAAA and ISTEA. Some of these are already planned, as indicated in the UPWP. Specifically, the following issues will need to be addressed to assure that the models are adequate for testing a wide range of transportation/land use policies:

- H-GAC's trip generation models are cross-classification models based on household size and income, but insensitive to transportation supply/price and urban design/density variables. H-GAC will need to consider methods to incorporate these variables to make the models more sensitive with regard to policy.

- H-GAC's trip distribution models use 24 hour average speeds and do not adequately incorporate cost in zone to zone impedances. To satisfy concerns of environmental groups, congested peak period speeds will need to be used as input where appropriate. In other words, travel times from the peak period assignment, which are currently fed back to the mode choice model, will also have to be fed back to trip distribution. The UPWP indicates this will be included in the modeling process.

- Mode choice/auto-occupancy models will need to be sensitive to cost variables. The logit model currently used to estimate the transit share is sensitive to cost; however, the auto-occupancy models do not incorporate cost as a variable. They are insensitive to parking costs and/or tolls.

- Traffic assignment should be capable of providing traffic volumes and speeds by time-of-day to be useful for air quality analysis. The UPWP indicates that improved methods are being sought for estimating peak speeds. However, speeds at other times of the day will also be needed.

- The traffic assignment model should also be made sensitive to tolls to allow testing of pricing policies. The UPWP indicates that this is planned.

- Currently, land use projections are made exogenously. The effects of transportation supply and pricing policies on land development patterns are not considered in the modeling process. To satisfy concerns arising from the CAAA and the need to consider impacts of transportation decisions on land use and the consistency of transportation and land use plans,

H-GAC should consider developing land use models which are sensitive to variables such as pricing and land development.

The H-GAC modeling report indicates an 18 percent error on one screenline across the study area. This figure is high compared with the commonly used yardstick of acceptability of 10 percent; therefore, the models need to be revisited to identify sources of error. The UPWP indicates that modeling improvements are planned which include the development of new attraction models, trip distribution F-factors, and HOV estimation and assignment procedures. A peer review of the structure and characteristics of the models is also planned.

Observation and Suggestions

1. H-GAC's travel models could be enhanced to provide the capability to estimate the travel impacts of a wide range of transportation and land use policies, and to incorporate feedback loops where appropriate. The enhancements are addressed in the transportation/land use policies discussed above.

2. H-GAC could develop land use models capable of forecasting the impacts of transportation on land use.

3. The computerized procedures could be streamlined so that multiple iterations of feedback loops can be executed more efficiently. Having different agencies perform different steps of the modeling process using different computer packages will slow down the process considerably if multiple iterations of the 4-step process have to be run, with multiple sets of transportation/land use policies. H-GAC should assess the desirability of developing the capability of running the mode choice model independently.

B. Costing Methodologies

H-GAC obtains capital costs and operating and maintenance (O&M) costs from the implementing agencies. According to H-GAC, capital costs tend to be over-estimated. METRO does detailed estimates of O&M costs for transit as described in sections VI.B. and C. TxDOT also prepares detail costs for project planning, design and implementation stages. Costs borne by the private sector (for example, parking) are not included in evaluation of plan alternatives.

Observations and Suggestions

1. **Monitoring costs** -- H-GAC and the implementing agencies should adopt methods through which costs will be regularly monitored, projected, and reported to H-GAC. As the regional planning agency, the MPO should maintain current and thorough cost data.

VII. Ongoing Transit Planning

A. Organizational Issues

METRO is responsible for the metro area's transit planning and operation. Since its inception in 1979, METRO has evolved from an operator providing a traditional bus service into an aggressive organization that takes on mobility enhancement projects that include roadway and pedestrian improvements. The transit approach, broadened to include general mobility, is innovative and certainly redefines the term "multi-modal." Most importantly, the approach appears to recognize the uniqueness of the urban area, largely defined by the following characteristics:

- Population density is low and distributed over a large geographical area;
- Multiple activity centers compete with the CBD;
- The freeway and arterial roadway network is congested; and
- Extensive roadway and pedestrian improvements are needed to improve connectivity and enhance transit usage.

METRO's service area covers over 1,275 square miles of the western two thirds of Harris County and includes 15 separate jurisdictions. Finance sources are fare revenues, a 1 percent sales tax, federal and state grants, and interest income. METRO is governed by a nine member Board of Directors. Five members are appointed by the Houston Mayor and City Council, two by the Mayors of the other cities within the service area, and two by the Harris County Judge and Commissioners' Court.

METRO has a Strategic Business Plan that provides overall direction for the short and long term, and identifies service expansions and capital improvement projects. The plan is embodied in five documents. However, METRO has recently been instructed by its Board to prepare a single document by November, 1992. The five separate elements that comprise the overall Strategic Business Plan are described below.

- Phase 2 Mobility Plan - After a public referendum, the Plan for the year 2000 was adopted by METRO's Board in 1987. The Plan consists of the following four elements: 1) replacement and expansion of the bus fleet over the 13 year planning period; 2) maintenance and expansion of the transitway program; 3) the addition of a high speed, fixed guideway facility; and 4) the commitment of 25 percent of sales tax revenue through the year 2000 to fund "general mobility" type projects such as road and street construction.

  After the Plan's adoption, METRO entered into a federally mandated process to secure funding for the construction of a monorail system. METRO's Board has recently modified the Plan by dropping the commitment to developing a rail system. Instead, it has adopted a regional bus plan as the preferred alternative. (The regional bus plan is being incorporated into H-GAC's update of Access 2010).

- Long Range Financial Plan - This document forecasts all of METRO's revenues and expenditures through the year 2010.

- Long Range Research Activities - METRO conducts ongoing market and economic research in support of its short and long range planning activities. This includes a contract with the University of Houston for the preparation of population and employment forecasts for 1996.

- Five Year Capital Improvement Program (CIP) - This covers METRO's expansion of bus facilities and road and street projects. It indicates when projects, such as park and ride lots, will be complete, and when new buses will be available. The General Mobility Project component of the CIP also affects bus service by indicating when new or improved roadways will be available for use by buses.

To distribute 25 percent of its sales tax revenue for general mobility projects, METRO has developed a benefit-cost procedure to rank projects that have been submitted by local jurisdictions. This procedure, which focuses primarily on quantifying reductions in person travel time and vehicle operating costs, also incorporates social costs (such as the economic impact on minority neighborhoods). The procedure establishes a rationale for determining which projects to fund in six different categories: roadway grade separation, railroad grade separation, roadway widening/improvement, roadway extension, intersection improvements and overlays.

METRO has also entered into a two year agreement with the City of Houston to contribute approximately $50 million of its sales tax revenue for Houston to use for roadway and traffic improvements. Since Houston's budget has been running at a deficit, this contribution frees up city funds to pay for police and other services. METRO has sizeable reserves which allows it to provide Houston with financial assistance. It is conceivable that the Houston Mayor will request METRO to extend its funding to the city beyond the two year agreement.

METRO and H-GAC staff work together to identify planning projects eligible for federal funding under the annual UPWP. METRO suggests projects and consults with H-GAC about funding availability. Its list of projects for inclusion in the TIP includes projects that are possible candidates for Section 3, 6 or 9 funding, as well as projects which use only local funds. METRO also works with H-GAC and TxDOT to develop TSM and congestion management projects suitable for federal funding.

METRO is also spearheading the implementation of a region-wide advanced technology program that has TCM components. Its staff is examining the implementation and coordination of a region-wide intelligent vehicle-highway system (IVHS) program which would focus on the interaction between highway and transitway usage, and transmit improved information to potential highway users about congestion levels. METRO anticipates that information on congestion levels could influence individuals' choices to use high occupancy vehicles for commuting purposes. As part of this advanced technology program, METRO is considering developing a smart bus prototype. The intent is to use automation to improve fare collection, passenger counting, and

data transmission regarding bus operations, particularly for breakdowns, and to develop demand responsive bus operations.

Observations and Suggestions

1. **Time frames** -- The elements of the strategic plan could be better coordinated by establishing consistent short and long range time frames for regional growth and development, programming capital improvements and service enhancements, and forecasting revenues and expenditures. This effort could be enhanced by preparing one document with each of the relevant components.

2. **Improving inter-relationship between plans** -- From a regional perspective, the inter-relationship between METRO's Phase 2 Mobility Plan and the region's transportation plan could be improved by using consistent short and long range time frames; articulating common goals and criteria for project assessment and inclusion; recognizing METRO's importance in implementing multi-modal and enhancement type projects that are key to satisfying the CAAA and ISTEA; and involving key decision-makers who are molding METRO's strategic direction in the MPO's 3-C planning process.

   In the future, METRO's competition for flexible ISTEA funds may require that transit proposals be presented in terms of their contribution to regional objectives.

3. **Incorporation of air quality concerns** -- In the update to its strategic business plan, METRO could describe and quantify how projects improve regional air quality, and indicate how air quality objectives influence decision-making. Specifically, METRO could incorporate air quality concerns into its project assessment analyses for distributing funds for locally sponsored roadway projects; assessing new transitway and transit center construction; determining whether or not to initiate service, particularly to outlying employment centers; and assessing existing service.

4. **Application of advanced technology** -- METRO has been examining applications of advanced technology including IVHS and smart buses to mitigate congestion and manage air quality impacts. METRO is encouraged to move forward with its region-wide advanced technology program, and incorporate these components into the planning process.

B. Performance of Existing Service and Development of New Service

METRO routinely evaluates existing service and new service proposals. Its evaluations are based on a commitment to operating the most efficient service possible, using the financial resources of the Authority, and maintaining service to those who need it most. Service evaluations are also guided by METRO's regional bus concept. The intent is to move from a radial system to intra-city crosstown plan with a focus on service to the region's activity centers.
METRO gathers and evaluates extensive data on operations, most notably ridership, service measures (on-time performance, equipment failures, etc.), costs and revenues. Although fare box

recovery rate is currently at 29 percent, METRO anticipates this will improve to 40 percent to 50 percent by the year 2000.

METRO's Board expects its staff to measure route performance. Starting in FY 1990, a program was initiated for the purpose of completing an in-depth review of every route within a four year period. METRO has also initiated an evaluation of vehicle assignments to determine whether or not vehicle capacity matches demand. Shifts in the vehicle size assignments have already occurred. Minibuses are being assigned to lower use routes, and forty-five foot buses or articulated buses are being assigned to higher use corridors.

If a route is not performing to expectation, METRO makes every attempt to salvage it. Different techniques, including route marketing and increased frequency, are employed to increase ridership. METRO maintains service on certain low ridership routes if it determines that the route serves a "life-line" purpose for riders. Typically, these "life-line" routes have high percentages of elderly or handicapped patrons with no viable alternative means of transportation.

METRO uses a cost allocation model to evaluate the productivity and cost effectiveness of each route. The process begins by splitting METRO's annual operating costs among ten different service types. These are then stratified into costs associated with system wide vehicle miles, vehicle hours, peak buses, and vehicles operated on the transitway. Then, the route's scheduled miles, hours, peak buses, and vehicles on transitways are multiplied by the appropriate disaggregate cost factor to estimate the route's total operating cost.

For new service development, METRO evaluates candidate projects on three progressive levels. The first level determines whether or not the project will benefit more riders than it disadvantages. The second level evaluates the candidate projects to determine how well they would perform versus the average of similar existing routes. For the third level evaluation, the candidate projects receive a composite score based on five categories of data: 1) new riders attracted; 2) number of requests; 3) new service coverage; 4) system connections and employment centers served; and 5) transit dependency.

C. Capital Planning (Transit Structure, Vehicle and Equipment Planning)

Replacement and rehabilitation programs are developed for vehicles, equipment, and facilities on an annual basis as an integral part of the operating and capital budget cycle. A survey of METRO-owned bus operating and support facilities and warehouses is underway to prepare a rolling five year preventive maintenance and upgrade program. Once established, this program will be updated annually during the budget preparation cycle. These activities are not noted in the UPWP.

The effectiveness of METRO's facilities, fleets and equipment is reviewed against the objectives of the Authority for service, efficiency, and effectiveness. The annual operating budget establishes performance goals which are measured monthly; it includes such items as cost, safety and productivity factors, and service levels. Condition surveys of rolling stock were completed

in the fall of 1991, and facility reviews were conducted during the spring of 1992. Life cycles of equipment and vehicles are included in determining replacement programs. The bus replacement program estimates the remaining life of buses and planned rehabilitations as factors in projecting future replacements.

D. Transit Management Analysis

METRO's Route Productivity Review Process is designed to effectively match available resources to ridership levels. Identification of routes for productivity improvements depends upon comments from the Customer Service and Community Relations divisions, and information from bus operators, street supervisors, schedulers and other personnel, and the ridership monitoring and evaluation program. The Service Implementation Division also identifies routes for productivity improvements. Fairly new routes are selected for productivity improvements based on ridership level. For older routes, a ranking is developed based on a number of indicators, including subsidy per passenger boarding; cost recovery ratio; passenger boardings per mile; and passenger boardings per hour.

The route performance review includes a brief history, a description of operational characteristics, and a list of all major attractors and generators. Additional categories of data are compiled and analyzed. These include the following: the latest origin and destination demographics; time of day, monthly and quarterly ridership numbers; and capacity utilization and load factors.

METRO will then take a number of a steps to improve performance on routes that have received a below average rating. The first step undertaken is route promotion and marketing. If the number of passengers per trip does not rise above seven, METRO will consider adjusting the schedule; eliminating unproductive trips; reducing service frequency and span; eliminating midday and late night services; and reducing or eliminating weekend service. If these efforts are not successful, METRO will assign smaller vehicles to the route. The route profile analysis also identifies activity centers that would help redesign poor performing routes. The redesign may include instituting turnbacks, extending service to new markets and re-routing.

If the productivity changes on a route fail to increase ridership after six months and the service is operating at minimum frequency and time periods, a decision is made either to maintain the route for social or "lifeline" reasons or to recommend to the Board that the route be eliminated.

The route profile analysis also includes services that perform above the system average. The first and last trips on these routes are analyzed and, depending on their performance, recommendations are made to use articulated buses, increase the number of trips, or increase the length of service.

In addition to this, METRO has identified personnel management, organizational planning, and safety as key priorities. Its Operators Training/Safety program includes training for new operators as well as refresher training for long-term employees. Emphasis is placed on accident prevention, safe driving skills, and vehicle knowledge. METRO's contract with the Transport

Workers Union includes a clause which offers incentive bonuses for meeting an annual low accident rate. METRO also has a professional training schedule coordinated through the Human Relations Division which offers courses in time management, developing supervisory skills, value engineering, and negotiating professional service contracts.

In terms of safety planning, every operator who is involved in an accident must notify the Dispatch Office immediately. This action is followed by a written accident report forwarded to the Operations Division Superintendent. Each accident report is classified as preventable or unpreventable. Preventable accidents require disciplinary action or retraining.

Observations and Suggestions

1. **Monitoring demand** -- If service is increased in response to new pressures from the CAAA, these expansions should be monitored to identify whether actual demand meets expectations, and the extent to which new riders who formerly drove alone begin using high occupancy vehicles.

2. **Collection and use of performance data** -- METRO is commended for the impressive range of performance data that it collects and analyzes, and its application of data to determine whether or not to maintain a route with low service for "life-line" or social purposes.

E. Financial Planning

METRO regularly assesses its financial condition, both as part of the short-term budgeting process and the long-term planning process. METRO assesses its financial condition in two ways: cash flow analysis and operating statement analysis. METRO employs a spreadsheet model which includes all forecasted sources and uses for 18 years. Currently METRO's financial situation is healthy, with a dedicated 1 percent sales tax that generates over $210 million per year and a cash reserve generating an additional $50 million per year in interest income. All operating deficits can be covered with bus fares and sales tax revenue, and the capital plans are programmed so that METRO never runs a cash deficit.

F. Planning for the Americans with Disabilities Act (ADA)

A paratransit plan has been developed and adopted by the Board, and submitted to FTA for concurrence. METRO has a staff task force which meets weekly to develop recommendations for Board adoption and management implementation for non-service ADA compliance areas. Also, an accessibility task force with representatives from different disabled groups meets once a month. Its mission is to create a priority ranking for the conversion of different routes from non-accessible to accessible.

Currently, 20 percent of METRO's bus fleet is accessible. However, all future bus acquisitions will include lifts. By the end of FY 1992, 300 new forty foot buses and 85 minibuses equipped with wheelchair lifts were to be delivered. Due to street design and infrastructure deficiencies,

not all region-wide bus stops are wheelchair accessible. METRO is committed to making street level improvements to improve wheelchair accessibility to region-wide bus stops. These improvements include the construction of sidewalks, curb cuts, and shelters.

In addition to the lift-equipped, fixed route bus service, METRO operates METROLift, a paratransit program, that consists of door-to-door van service for disabled riders and a subsidized taxicab service. During FY 1992, the METROLift program was to expand its service area in accordance with ADA requirements. Subsidized taxicabs, rather than the van program, will be used to service the expanded area. The service expansion will allow for more spontaneous trips to be made. In support of this effort, the structure for making reservations will be changed to increase productivity and responsiveness.

Observations and Suggestions

1. **Compliance with ADA requirements** -- METRO has been proactive in its efforts to comply with the ADA requirements. Transit and infrastructure improvements have been included in METRO's strategic business plan and the TIP.

G. Outreach Activities

Through H-GAC's Privatization Committee, METRO participates in area-wide service delivery planning efforts. This committee includes representatives of private firms who are interested in providing contract transit service. Additionally, through the public hearing process, METRO solicits community input concerning all service changes. Additional information regarding METRO's outreach activities is included in section V.E.

H. Planning Activities for a Drug-Free Work Place

METRO's Board has adopted a Drug-Free Workplace Policy that exceeds Federal requirements. It requires testing in the following instances: pre-employment, post-accident, random (for all employees) and return to work (after a prescribed absence). Outreach efforts include briefings for new employees, notices posted on bulletin boards, payroll "stuffers," and training for supervisors. METRO also offers counseling through its Employee Assistance Program.

I. Capital and Operating Plans

This section has been incorporated into earlier discussions of capital planning (section VII.C) and the performance of existing service and development of new service (section VI.B).

APPENDIX 1

Participants in Houston Area Planning Review

Federal Transit Administration (FTA)

Headquarters:
Deborah Burns, Project Manager

Region 6:
Blas Uribe, Director, Office of Grants Management

Federal Highway Administration (FHWA)

Headquarters:
Patrick DeCorla-Souza, Community Planner

Region 6:
Martin Kelly, Urban Transportation Planner

Texas Division:
Barbara C. Maley, Urban Planner

U.S. Department of Transportation/Volpe National Transportation Systems Center

William Lyons, Volpe Center Project Manager
Robert Brodesky, EG&G Dynatrend Inc. (Consultant)
Frederick Salvucci, Massachusetts Institute of Technology (Consultant)

Houston-Galveston Area Council

Jack Steele, Executive Director
Mostafa Abou-Ghanem, Transportation Planner
Sabas J. Avila, Transportation Engineer
Veronica Baxter, Senior Transportation Planner
Nancy Bentch, Chief Transportation Planner
Jerry Bobo, Chief Transportation Planner
Alan C. Clark, Transportation Manager
Steve Howard, Director, Program Operations
Aquina Jance, Grants Coordinator

APPENDIX 1, Cont.

Houston-Galveston Area Council (Cont.)

Jacqueline Lentz, Senior Transportation Planner
Andy Mullins, Senior Transportation Planner
Brian Wolfe, Transportation Planner

Metropolitan Transit Authority of Harris County

Edie Lowery, Director of Grants Programs
Jim Bunch, Manager of Systems Analysis
John Sedlak, Assistant General Manager, Transit Systems Development
Carole Ann Smith, Manager of Financial Planning and Investment
Darryl Puckett, Director of Transportation Programs
Stephen Albert, Manager of Transportation Programs
Francis Britton, Assistant to the General Manager for Management and Budget

City of Houston

Christine Ballard, Department of Planning

City of Galveston

Harold Holmes, Director, Planning and Transportation
Anthony Rodriquez, Assistant Director, Planning and Transportation

Texas Department of Transportation

Hans C. Olavson, District Planning Director, District 12
Joe N. Impey, Area Planning Supervisor, Division of Transportation Planning
Dorn E. Smith, Planner, Division of Transportation Planning

Texas Air Control Board

Richard E. Flannery, Staff Services Officer

APPENDIX 2

Agenda for Urban Transportation Planning Review Meeting

April 27-30, 1992

Houston-Galveston Area Council
P.O. Box 22777
3555 Timmons
Houston, Texas 77927
(713) 627-3200

Monday, April 27 *at Marriott - Galleria*

5:00 -		Federal Review Team meeting
Tuesday, April 28 *at HGAC*		
8:30 - 9:30		Federal Review Team meeting
9:30 - 10:15	Peggy Crist FTA, Region VI	Welcome and introductory remarks
	Martin Kelly FHWA, Region 6	
	Deborah Burns FTA, Headquarters	Objectives for planning review
		Introduction of participants
	Jack Steele, HGAC	Introductory remarks
	Tx DOT	Introductory remarks
10:15 - 10:30	Bill Lyons USDOT/VNTSC	Overview of meeting and schedule
		Discussion of urban transportation planning process (Roman numerals following topics below refer to attached questionnaire, which provides discussion questions).

APPENDIX 2, Cont.

Tuesday, April 28 (continued)

Format for all sessions - topic overview from regional agencies, building on written responses, with discussion led by review team members.

How the planning process works in the Houston Region

Local Transportation Issues (I.B)

10:30 - 11:00	HGAC	Presentation
11:00 - 12:00	Peggy Crist, FTA, VI Fred Salvucci, VNTSC/MIT	Discussion
12:00 - 1:00	Lunch	

Organization and management of the process -- Agencies' roles and responsibilities (II)

1:00 - 1:30	HGAC	Presentation
1:30 - 2:15	Barbara Maley, FHWA, TX Division Fred Salvucci, VNTSC/MIT	Discussion

Products of the process (III)

2:15 - 3:45	HGAC	Presentation
3:45 - 4:45	Martin Kelly, FHWA, 6 Bill Lyons, USDOT/VNTSC	Discussion

APPENDIX 2, Cont.

Wednesday, April 29 *at HGAC*

How the planning process works in the Houston Region (continued)

Elements of 3-C process (multi-modal dimension) (IV)

9:00 - 9:30	HGAC	Presentation
9:30 - 10:30	Martin Kelly, FHWA, 6 Bill Lyons, USDOT/VNTSC	Discussion
		Approach to air quality (Clean Air Act) (IV.D)
10:30 - 11:00	HGAC, TX Air Control Board	Presentations
11:00 - 12:00	Martin Kelly, FHWA, 6 Fred Salvucci, VNTSC/MIT	Discussion
12:00 - 1:00	Lunch	
1:00 - 4:30	*at Metropolitan Transit Authority (METRO)*	

Format - overview on each topic from METRO with discussion led by review team members

Ongoing transit planning (VI)

METRO	Introductory remarks
Peggy Crist, FTA, VI Bill Lyons, USDOT/VNTSC	Discussion

Organizational issues - strategic planning (VI.A)

Service performance and development (VI.B)

APPENDIX 2, Cont.

Structure, vehicle, and equipment planning (VI.C)

Transit management analysis (VI.D)

Financial planning (VI.E)

Americans with Disabilities Act (VI.F)

Outreach activities (citizen and minority participation, DBE, private sector involvement) (VI.G)

Planning for a Drug-Free Work Place (VI.H)

Transit Capital and Operating Plans and Programs (VI.I)

APPENDIX 2, Cont.

Thursday, April 30 *at HGAC*

9:00 - 11:30		**Parallel Breakout Sessions**
		Session 1 --
		Transportation Planning Techniques (V.)
		Travel demand forecasting Costing methodologies
	HGAC	Presentation
	Patrick DeCorla-Souza, FHWA, Headquarters	Discussion
		Session 2 -- (if necessary)
9:00 - 11:30		Complete outstanding items
11:30 - 1:30 Team	Lunch	Working lunch -- Federal Review meeting -- Draft Findings
1:30 - 3:00	Peggy Crist, FTA, VI Martin Kelly, FHWA, 6	Meeting summary -- Findings and Follow-up Actions (VII)
		Regional concerns
		Next steps

APPENDIX 3

Documentation Provided by Houston Regional Agencies

Houston-Galveston Area Council

Unified Planning Work Program - "1991/1992 Unified Planning Work Program for the Gulf Coast State Planning Region, March 1992."

Transportation Improvement Program - "1992 Transportation Improvement Program for the Gulf Coast State Planning Region."

"1993 Transportation Improvement Program for the Gulf Coast State Planning Region, August 1992" (DRAFT).

Long Range Transportation Plan - "Access 2010: The Houston-Galveston Area Metropolitan Transportation Plan, November 1989" (includes Appendix C: Air Quality Conformity Analysis).

"Supplement 1992 Air Quality Conformity Analysis."

"Development, Update and Calibration of 1985 Travel Models for the Houston Galveston Region, June 1991."

"1991 Performance Report for the Gulf Coast State Planning Region, December 1991."

"1990 Houston-Galveston Regional Transportation Report."

"Gulf Coast State Planning Region Multimodal Transportation Planning: History of Committees, 1964-1992."

"Suburban Mobility Study Report for Two Major Suburban Activity Centers in Houston, Texas, July 1991."

Metropolitan Transit Authority of Harris County

"Annual and Five Year Service Program, Fiscal Years 1992-1996."

"Comprehensive Annual Financial Report for the fiscal year ended September 30, 1991."

APPENDIX 3, Cont.

"Operating Budget, General Mobility & Traffic Management Budget, Capital Budget, March 1992."

"Recommended Operating and Capital Budgets, Fiscal Year 1992, September 1991."

"Transit System Comparison Study, Comparative City Data Base, August 1989."

"Planning for a Drug-Free Workplace, April 1992."

"Americans with Disabilities Act of 1990, Complementary Paratransit Service Implementation Plan, January 1992."

"Labor Agreement between the Metropolitan Transit Authority and the Transport Workers Union of America Local 260, August 1990."

"Mobility Projects, Benefit/Cost Analysis Methodologies, January 1990."

"Priority Corridor Alternatives Analysis, Methods Report No. 3, Travel Demand Forecasting, January 1991."

"Action for a Cleaner Tomorrow, April 1992."

"Liquefied Natural Gas in Transportation."

Texas Department of Transportation

"TxDOT Project Selection Process."

Texas Air Control Board

"Inventory Preparation Plan - 1990 Base Year Emissions Inventories for Ozone and CO Nonattainment Areas in Texas, September 1991."

Committee for Regional Mobility

"Regional Mobility Plan for the Houston Area, 1989, December 1989."

APPENDIX 3, Cont.

Harris County Improvement District #1

"Comprehensive Transportation Strategy, Final Report, March 1991."

* U.S. GOVERNMENT PRINTING OFFICE: 1994-501-082/80054